



Waste Minimization: Increased Profits and Productivity HADCO Corporation

■ **\$1.7M Investment;
Payback in 3 Years**

■ **Eliminated Continuous
Monitoring**

■ **Eliminated Disposal of
800,000 Pounds of
Solvents**

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What is the HADCO Corporation?

HADCO Corporation is one of the nation's largest manufacturers of printed wiring boards, the fundamental building blocks of all electronic components. Common uses include computers, telecommunications, medical devices, and automotive components. The complex, multi-step manufacturing process requires many hazardous solvents, including 1,1,1-trichloroethane (TCA) and methylene chloride.

What Did They Accomplish?

Through their continued efforts in waste minimization, HADCO has succeeded in reducing both releases and transfers of toxic chemicals targeted in EPA's 33/50 program by 99.5%. As a result, the facility saves \$600,000 per year in avoided chlorinated solvent purchases and associated disposal costs.

Environmental Achievements

HADCO's achievements at the Derry, New Hampshire facility occurred in two stages. First, they implemented a solvent recovery system on two of the five production lines that used methylene chloride. At the same time, they eliminated

chlorinated solvents from the other three production lines. In the second stage, HADCO eliminated TCA and methylene chloride completely from all five production lines by switching to aqueous solvents such as monoethylamine.

Elimination of chlorinated solvents has impacted more than just air and water emissions: annual disposal of 800,000 pounds of spent methylene chloride has also been eliminated. Prior to implementing the program, HADCO was the largest environmental polluter in New Hampshire. These achievements have greatly improved public relations, and moved HADCO down the list of New Hampshire's pollution generators.

Regulatory Relief

To meet regulatory requirements for the solvent recovery system, HADCO was required to install a continuous emissions monitoring system (CEMS) and to produce monthly reports. The CEMS generated high maintenance and operational costs. Once the solvent recovery system was discontinued, the costly CEMS was no longer required.

Eliminating chlorinated solvents reduced regulatory burdens associ-

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ated with several environmental statutes:

- Clean Air Act — eliminated solvents were targeted for phase out;
- Emergency Planning and Community Right-to-Know Act — eliminated solvents were reportable under Section 313;
- Resource Conservation and Recovery Act — eliminated solvents were regulated as hazardous.

The Implementation Process

Impetus for the initial solvent recovery system and later for the elimination of TCA and methylene chloride primarily came through HADCO's senior management. They thought HADCO should be "...number one in making circuit boards, not number one in Toxic Release Inventory releases." Both approaches were developed in house, involving site engineers and the corporate vice president of engineering. Implementation of the initial solvent recovery system required about a year from inception to execution, though Mr. Wilmot, Manager of Corporate Safety, Health, and Environmental Affairs, noted that obtaining air and water permits created the biggest delays. Once the recovery system was implemented, workers needed to be trained in operating the CEMS. Afterward, HADCO phased out chlorinated chemicals from all production lines.

HADCO monitored effectiveness of the systems in two ways:

- Cost accounting, which examined operational costs of pro-

duction and costs of chemical purchasing; and

- Chemical monitoring of both raw material inputs and effluent.

Economics: Costs and Paybacks

Funding for these improvements came from internal sources. While Mr. Wilmot noted that there is typically internal competition for capital improvement projects, funding for these improvements was non-discretionary.

HADCO invested \$1.7 million in the project, which covered the cost of installing the initial solvent recovery system on two production lines and the cost of converting all five chlorinated solvent-using lines to aqueous solvents. This included equipment purchase, installation and labor.

Payback for these activities came within three years, and resulted primarily from HADCO no longer spending \$600,000 per year on chlorinated solvents. There were no reductions in disposal costs - in fact, before implementing these changes, spent methylene chloride was shipped off site at no charge for recovery. The current aqueous solvents annually generate 200,000 pounds of sludge that HADCO must pay to have disposed as hazardous waste.

Hurdles

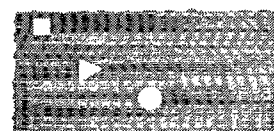
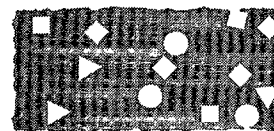
Implementation of these changes presented no major hurdles. The most difficult problem with the solvent recovery system was getting

across the fact that when the CEMS malfunctioned, production had to be stopped. This required a significant behavioral change in a plant that operates continuously. This behavioral change was only temporary, since elimination of the chlorinated solvents also eliminated the need for the CEMS. There were no negative impacts to the quantity and quality of goods produced.

Words to the Wise

Lee Wilmot cautions those considering implementation of waste minimization projects to look closely at their cost accounting systems. "Total cost accounting is what is selling pollution prevention and waste minimization. But if you don't factor in the cost of those releases going up your stack or out your discharge or out in bulk shipments for off site treatment and disposal, then you don't really have a good appreciation [for the actual costs of pollution]. If all you're focusing on is how much it costs to operate your solvent recovery system or wastewater treatment system, or transporting that waste to the end site, you've missed a big, big part of your cost of operations."

WASTE MINIMIZATION NATIONAL PLAN



Reducing Toxics in Our Nation's Waste

For more information about the Waste Minimization National Plan, call (800) 424-9346 or check the World Wide Web at <http://www.epa.gov/epaoswer/hazwaste/minimize>